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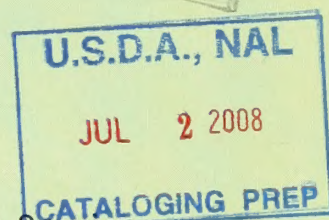
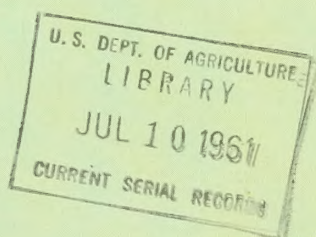
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NUTRITIVE QUALITY of LITTLE BLUESTEM

in the Missouri Ozarks



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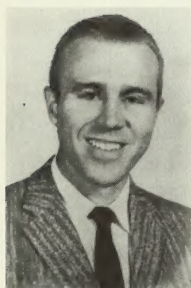
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THE AUTHORS



ROBERT F. BATTERY received his undergraduate training at Texas Tech College. He earned his B.S. in Animal Husbandry and Range Management in 1953 after serving with the Marine Corps in Korea in 1950-51. In 1955 he received his M.S. in Range Management from Colorado A&M. Bob served in various capacities at the Rocky Mountain and the California Forest and Range Experiment Stations before joining the technical staff of the Central States Station as a Range Conservationist in 1958. After two years of work in western Missouri he recently transferred to the Klamath National Forest in California. He has authored nine publications on the problems of range management, wildlife management, type conversion, and forage-weather relationships. He is a member of the American Society of Range Conservationists and Xi Sigma Pi, forestry honorary society.



JOHN H. EHRENREICH is a Range Conservationist and project leader at the Columbia center in work dealing with forage identification, evaluation, production, and the effect of forest management on forage and wildlife habitat. He received his B.S. degree in Forestry and Range Management from Colorado A&M in 1951. After serving 2 years in the Air Force, he earned his M.S. in Range Management at Colorado A&M (1954); and later (1957), his Ph.D. in Ecology from Iowa State University. John holds memberships in the American Society of Range Management, Ecological Society of America and the Iowa Academy of Science. He is also a member of four scientific and professional honorary societies: Phi Kappa Phi, Sigma Xi, Xi Sigma Pi, Gamma Sigma Delta. He has authored or co-authored more than a dozen publications in the fields of range management and the ecology of grasslands.

NUTRITIVE QUALITY of LITTLE BLUESTEM

in the Missouri Ozarks

ROBERT F. BUTTERY

JOHN H. EHRENREICH

The forage on most Ozark ranges, like that on nearly any range, is deficient in either quality or quantity at some time of the year. More precise information on the kind and amount of these deficiencies would help in correcting resulting nutritional deficiencies in range cattle. As a first step toward providing such information, a study was begun in 1954 to find out how the nutritive quality of little bluestem (*Andropogon scoparius*) varies throughout the seasons on different sites and on burned and unburned range. This species makes up more than half the total native forage in the Missouri Ozarks (6)¹.

Forage samples (400 grams each) were collected every month on the following four sites: (1) glade, (2) open hardwood, (3) cleared hardwood, and (4) open pine (figs. 1, 2, 3, and 4). Small areas were prescribed-burned on the glade and open hardwood sites in February 1955. The samples were analyzed for percent protein, calcium, phosphorus, nitrogen-free extract, fat, ash, and fiber².

¹Numbers in parentheses refer to Literature Cited, page 9.

²Chemical analyses were made under the direction of Dr. Charles W. Gehrke, Professor of Agricultural Chemistry and Supervisor of Experiment Station Chemical Laboratories, University of Missouri, Columbia, Missouri.



The glade site is located on a typical open glade on the Ava District of the Missouri National Forest. The open hardwood site is located on a fairly open, droughty, hardwood site on the Sinkin Experimental Forest near Salem. The cleared hardwood site is located about 10 miles east of Salem on a typical poor hardwood site where overstory trees were girdled and sprouts sprayed with herbicides in the summer of 1952. The pine site is located in a pure stand of even-aged shortleaf pine on the Sinkin Experimental Forest.

Figure 1. — (Top, left) Glade ranges such as this one are an important range type in the Ozarks.

Figure 2. — (Bottom, left) An open hardwood site burned annually. There is no leaf litter here and grass and other herbaceous production is relatively high.

Figure 3. — (Right) A shortleaf pine stand with a heavy litter accumulation and very little grass and other herbaceous production.

Figure 4. — (Below) A cleared hardwood site with a vigorous stand of little bluestem.



Nutrient Requirements

The amount of nutrients required by cattle varies according to size, age, stage of pregnancy or lactation, or other conditions. For instance, the percentage of protein in the diet should be nearly twice as high for young animals and nursing cows as for nonpregnant, dry cows.

The nutrients most deficient in native forage at some time during the year are protein, phosphorus, and calcium. The approximate minimum requirements of these nutrients (percent oven-dry weight) for acceptable performance of growing animals, breeding cows, or cows nursing calves are: Crude protein, 9 percent; phosphorous, 0.18 percent; calcium, 0.24 percent. For nonpregnant, dry cows the approximate minimum requirements are: Crude protein, 6 percent; phosphorous, 0.10 percent; and calcium, 0.15 percent (5).

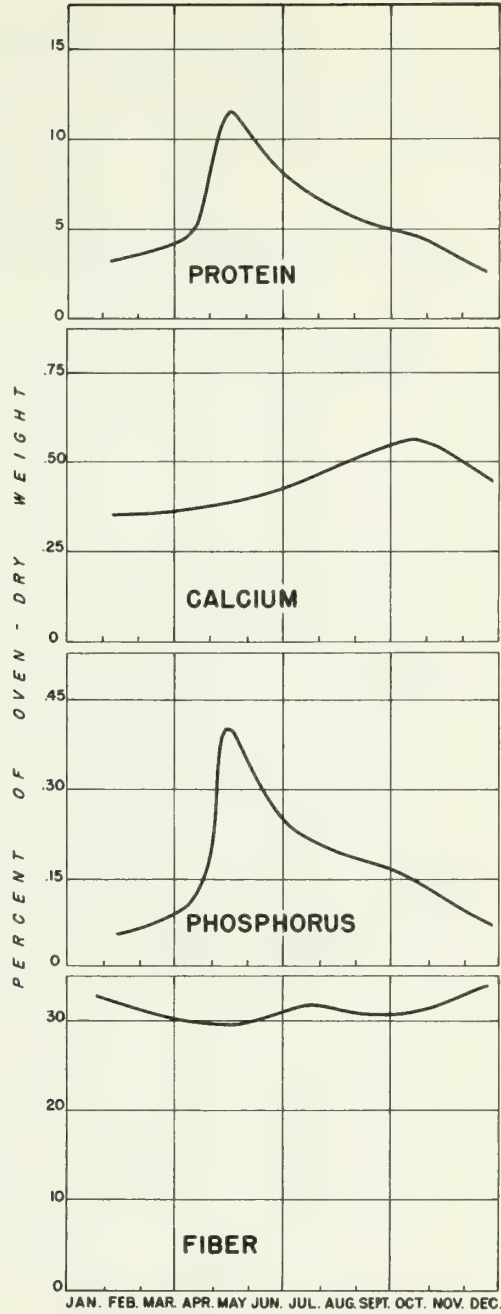
Site Comparison

There were no statistically significant differences among sites in nutritive content of little bluestem at different times of the year.

Protein. — Generally speaking, protein was adequate for dry cows from mid-April to September but adequate for growing animals and nursing cows only during May and June. Protein content was highest on the glade site and lowest on the pine site during the growing season, which would normally be expected because of earlier growth on open areas (fig. 5). Little bluestem growing on the pine site had less protein than on other sites, but lost less during the summer months. This and the fact that protein content did not reach minimum requirements on the pine site until early May suggests that shading by pine trees retards the growing season for understory plants.

Phosphorus. — The phosphorus content was about the same on all sites during the early growing season. It met minimum requirements for most classes of cattle from about May through September on all sites except the glade where it became inadequate about the end of June (fig. 5). Phosphorus content was maintained longer on the pine site than on any other site. Maximum seasonal phosphorus content was less on the glade site than on the other sites and fell below the minimum requirement at an earlier date.

Figure 5.—Protein, phosphorus, calcium, and fiber content of little bluestem on open hardwood, glade, cleared hardwood and pine sites in the Missouri Ozarks — 1955.



Calcium. — The calcium content of little bluestem met minimum standards on all sites for cattle throughout the growing season. This corroborates Read's work (7) in the Arkansas Ozarks. During the growing season calcium was highest on the glade site and about equal on the other sites, except during the early growing season when it was lowest on the pine site.

Fiber. — The undigestible part of the plant, fiber, was most abundant on the pine site and about equal on the other sites all during the growing season.

Other nutrients. — There was no significant difference in fat, ash, and nitrogen-free extract between sites during the year.

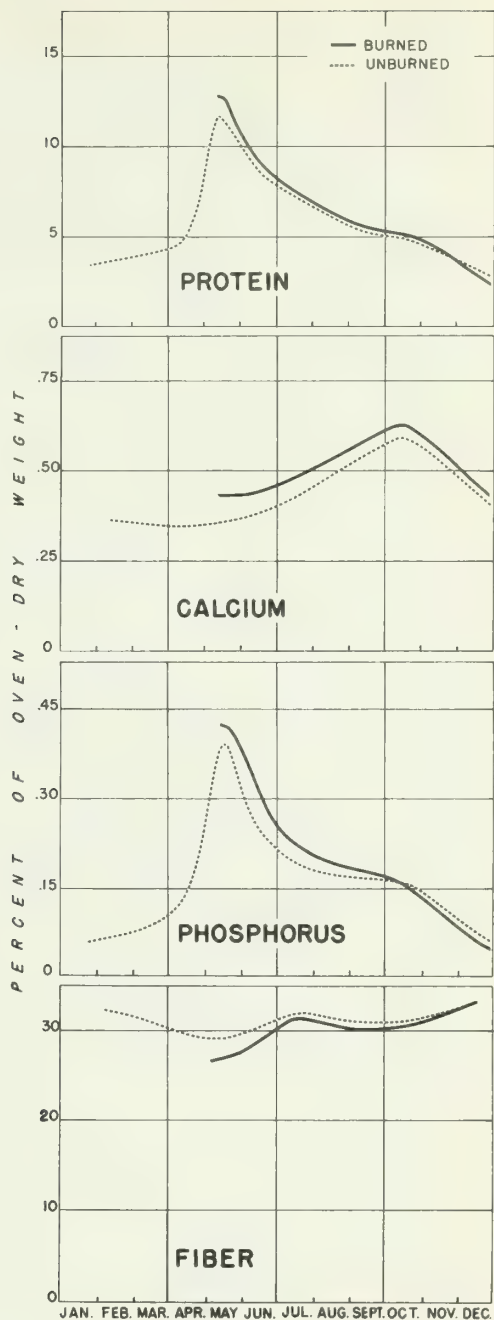
Burning

During the early part of the growing season following the burn there was a decrease in forage fiber content and an increase in calcium, protein, and phosphorus content on both sites (fig. 6). But this was only a temporary increase for two of these nutrients, because by the end of the growing season, and again after two growing seasons, there was no difference at all in protein and phosphorus content between the burned and unburned areas of either site. This corroborates findings of a Louisiana study. Campbell et al. (2) found that burning raised the protein content of pinehill bluestem (*Andropogon divergens*) only in the young leaf stage immediately following the fire, but had no effect during the full leaf and mature leaf stages. They reported that the effects of burning were temporary and may be more than offset by the damage done to both timber and forage by injurious burning or wildfire. In fact, Cassady (3) found indications that repeated burning may reduce grass production 40 percent or more.

Comparison of Years

During 1956 protein and phosphorus contents were slightly lower than in 1955 on all sites, but there was no significant difference in calcium content. Up to mid-summer fiber content was slightly higher in 1956. This suggests that there may be small yearly variations in nutrient content of forage plants.

Figure 6.—Protein, phosphorus, calcium, and fiber content of little bluestem from burned and unburned open hardwood areas in the Missouri Ozarks—1955.



Discussion

This study shows that protein in little bluestem is adequate for all classes of cattle only during about May and June. However, the plants sampled for this study were never grazed or reclipped, so no regrowth was sampled. Regrowth is high in protein and could lengthen the period of adequacy. Protein from other plants would also make a longer period of adequacy than this study shows. In a central Louisiana study Cassady (4) found that crude protein content of grass on plots harvested every 4 weeks remained between 9 and 10 percent throughout the growing season. In contrast, he found that crude protein in grass from unharvested plots declined from 9.5 percent in spring to 4.5 percent in late summer. Although this frequent close harvesting maintained high protein content in the grass, total production was greatly reduced. However, he felt that intensive spring and early-summer grazing might lengthen the cattle gaining season without drastically reducing forage production.

Contrary to the opinion of some, grass grown under timber is just as nutritious as that grown in the open. Protein content of little bluestem on pine land did not quite reach the level of that grown on the other sites, but it remained at a higher level for a longer time. Campbell and Cassady (1) found that the differences in nutritive values of grasses on open grass, longleaf pine, and scrub oak types in Louisiana were insignificant from March to November.

Little bluestem ranges do not furnish good enough forage for year-round grazing, but when used in a ranch operation which includes improved pasture and supplemental feeding, they can furnish nutritious forage for several months. The actual length of time would depend upon many factors such as site, range condition, season of use, fencing, location of salt and water, precipitation, class of cattle, and so forth. Generally speaking, however, because of the variety of forage species and forage regrowth, properly stocked little bluestem range in good condition should be able to furnish adequate nutrients from about mid-April through mid-August in the Missouri Ozarks.

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The Central States Forest Experiment Station is headquartered at Columbus, Ohio and maintains major field offices at:

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